DOCUMENT RESUME

ED 045 716 TM 000 290

AUTHOR Horst, Paul
TITLE Multiple Prediction Studies. Final Report.
INSTITUTION Washington Univ., Seattle.
SPONS AGENCY Office of Naval Research, Washington, D.C. Personnel and Training Research Programs Office.
PUB DATE Jun 70
NOTE 16p.

EDRS PRICE EDRS Price MF-$0.25 HC-$0.90
DESCRIPTORS Classification, *Data, *Factor Analysis, Measurement Techniques, Models, *Personal Adjustment, *Prediction, Predictor Variables, *Research Methodology, Statistical Analysis

ABSTRACT

This final report indicates the general areas of investigation in a program of research in the prediction of personal adjustment, conducted over a seventeen-year period. The crucial problems in the prediction of personal adjustment are fundamentally concerned with the data matrix which reflects the experimental designs and displays the essential information from the experimental observations. The research program has been primarily concerned with methodological aspects of these problems, but the techniques have also been applied to substantive data. A comprehensive bibliography records 36 theses, 47 technical reports, 26 journal articles, 8 monographs, 4 book chapters, and 4 books which have resulted from this research. (Author/CK)

ED 045716

FINAL REPORT

MULTIPLE PREDICTION STUDIES

Paul Horst

This research was sponsored by the Personnel and Training Research Programs, Psychological Sciences Division, Office of Naval Research, under Contracts 477 (08 and 33), Project NR 151-143.

Principal Investigator: Paul Horst
University of Washington

June 1970

TM 000 290

Reproduction in whole or in part is permitted for any purpose of the United States Government.

This document has been approved for public release and sale; its distribution is unlimited.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*
University of Washington, Seattle, Wash.

2a. REPORT SECURITY CLASSIFICATION
Unclassified

2b. GROUP

3. REPORT TITLE
Multiple Prediction Studies

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*
Final Report - May, 1953 through February 1970

5. AUTHOR(S) *(First name, middle initial, last name)*
Paul Horst

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
June, 1970	15	125

8a. CONTRACT OR GRANT NO.
Nonr 477 (08 and 33)

b. PROJECT NO.
NR 151-143

c.
None

d.

9a. ORIGINATOR'S REPORT NUMBER(S)
Final Report

9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*
None

10. DISTRIBUTION STATEMENT
This document has been approved for public release and sale; its distribution is unlimited.

11. SUPPLEMENTARY NOTES
None

12. SPONSORING MILITARY ACTIVITY
Personnel and Training Branch
Psychological Sciences Division
Office of Naval Research

13. ABSTRACT

This Final Report indicates the general areas of investigation in a program of research in the prediction of person adjustment, conducted over a period of seventeen years. The research, under the title of "Multiple Prediction Studies," was supported by Project NR 151-143, Contracts Nonr-477 (08 and 33), Office of Naval Research. The publications resulting from the research and listed in the bibliography include thirty-six (36) theses, forty-seven (47) technical reports, twenty-six (26) journal articles, eight (8) monographs, four (4) chapters in books, and four (4) books.

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Predictor Selection						
Multiple Prediction						
Optimal Classification						
Matrix Algebra						
Factor Analysis						
Multiple Set Analysis						
Incomplete Data Matrix						
Reduced Rank Prediction						
Configural Analysis						
Psychological Measurement						
Non-cognitive Measurement						
Binary Data						
Metric in Multivariate Analysis						

DD FORM 1 NOV 65 1473 (BACK)
(PAGE 2)

Security Classification

ED0 45716

FINAL REPORT

MULTIPLE PREDICTION STUDIES

Paul Horst

This research was sponsored by the Personnel and Training Research Programs, Psychological Sciences Division, Office of Naval Research, under Contracts 477 (08 and 33), Project NR 151-143.

Principal Investigator: Paul Horst
University of Washington

June 1970

Reproduction in whole or in part is permitted for any purpose of the United States Government.

This document has been approved for public release and sale; its distribution is unlimited.

ACKNOWLEGEMENT

The program of research on which this Final Report is based was made possible by the continuing support of the Personnel and Training Branch of the Psychological Sciences Division of the Office of Naval Research, U.S. Department of Defense, and the active interest of successive Heads of the Personnel and Training Branch--Drs. Denzel D. Smith, Glenn L. Bryan, and Victor Fields. Very substantial supplementary support was also provided by the U.S. Department of Health, Education, and Welfare.

A major debt of gratitude is due my many competent and loyal students and assistants who are too numerous to mention here but whose names appear in the appended bibliographies.

MULTIPLE PREDICTION STUDIES

This document constitutes the final report on a program of research in the prediction of personal adjustment supported by the Office of Naval Research under Contract Nonr-477 (33), Project NR 151-143, from April, 1962 through February, 1970. This research followed, without a break, a program in the same general area, also supported by the Office of Naval Research under Contract Nonr-477 (08), Project NR 151-143, from May, 1953 through March, 1962.

The crucial problems in the prediction of personal adjustment are, for the most part, fundamentally concerned with the data matrix which reflects the experimental designs and displays the essential information from the experimental observations. The research program has been primarily concerned with methodological aspects of these problems but the techniques have also been applied to substantive data. The research program under the earlier contract was concerned largely with the following major problems:

Predictor selection techniques for multiple criteria
Optimal test length for multiple prediction
Optimal classification
Simplified matrix algebra
Factor analytic technology
Multiple set analysis

The numerous technical reports, M.A. and Ph.D. theses, and published articles and monographs listed in the Final Report for the original contract, and reprinted in this report for convenient reference, provide detailed accounts of the specific research projects in the general areas.

During the current contract period, major effort was continued in the general areas of

Optimal classification
Factor analytic technology
Multiple set analysis
Simplified matrix algebra

In addition to these, research in the following areas was also conducted:

The incomplete data matrix
Rank reduction models for multiple prediction
Configural analysis techniques
Psychological measurement
Non-cognitive measurement
Binary data matrices
Prediction from nonrandom subgroups
Metric in multivariate analysis

Much effort has gone into the completion of the four books, listed in the bibliography, covering and integrating many of the results of the research under this and the previous contract. However, much of the work could not be included in these books and most of it is included in the numerous technical reports, Ph.D. theses, chapters in books, monographs, and published articles listed in

the bibliography.

The vast and highly technical field of prediction of personal adjustment would require a set of many additional volumes to cover adequately the current state of the art. At least one or more additional volumes would be required to set forth in detail the many urgent unsolved problems and to suggest well-indicated directions and areas for further research. This says nothing of the actual prosecution of the needed research.

It is hoped that the principal investigator may continue, even if at a more leisurely pace, to contribute to one or more of these three areas: (1) the orderly presentation of the current state of the art, (2) the outlining of further needed research, and (3) actual participation in this research. He rests assured, however, that many others with a longer productive life expectancy will continue to contribute in these three areas.

BIBLIOGRAPHY

Contract Nonr-477(33), Project NR 151-143

A. Ph.D. Theses

Schultz, Charles. Response set factors revealed by factor analysis of an unfounded item pool. May, 1962.

Burket, George R. A study of reduced rank models for multiple prediction. July, 1962.

Burk, H.W. Intra individual factor analysis with rotation to maximum similarity. September 1962.

Roudabush, Glenn E. A study in prediction from biographical information. November, 1963.

Sorenson, Richard C. Development and evaluation of a matrix transformation useful in personnel classification. August, 1965.

Wainwright, Gordon E. Configural information in item responses. September, 1965.

Bloxom, Bruce M. Anger-arousing instructions and the simplex in a personality questionnaire. January, 1966.

Fox, Leslie A. Association measures of binary variables: an empirical comparison with respect to factor structure reproduction. June, 1968.

Corey, Charles H. A comparison of four models for making predictions across institutions. August, 1968.

B. ONR Technical Reports

Horst, P. Matrix factoring and test theory. April, 1962.

Horst, P. Multivariate models for evaluating change. May, 1962.

Horst, P. Factor analysis of data matrices.
Part I Introductory background. January, 1964.
Part II Matrix factoring methods, A. February, 1964.
Part III Matrix factoring methods, B. March, 1964.
Part IV Categories, origin, and scale. April, 1964.
Part V Transformation problems and methods. May, 1964.
Part VI Special problems. June, 1964.

Horst, P. Current problems in linear and configural prediction. September, 1964.

Wainwright, G.E. Configural Analysis. September, 1964.

Horst, P. Psychological measurement and prediction.
Part I Background for psychological measurement. October, 1964.
Part II Multidimensionality and psychological measurement. October, 1964
Part III The structure of tests. December, 1964.
Part IV The reliability of measures. December, 1964.
Part V Measurement and prediction. December, 1964.
Part VI Special topics. December, 1964.

Fox, L.A. Configural analysis. July, 1965.

Bloxom, B.M. Instructions and the simplex in personality assessment. January, 1966.

Bloxom, B.M. Obtaining a best fitting factor structure. April, 1966.

Bloxom, B.M. Covariance solutions for M sets of data. May, 1966.

Horst, P. Measurement of personality dimensions.
Part I Psychological measurement. May, 1966.
Part II Special problems. May, 1966.
Part III Computational procedures. May, 1966.
Part IV Experimental applications. Sections A and B. May, 1966.

Horst, P. The missing data matrix. July, 1967.

Horst, P. Matrix approximation and residual variance scaling. November, 1967.

Horst, P. Generalized scale free matrix approximation with variable loss function. January, 1968.

Horst, P. Generalized factor analysis.
Part I Rationale. April, 1969.
Part II Application. April, 1969.

Horst, P. Scale free reduced rank image analysis. June, 1970.

C. Journal Articles

Horst, P. Matrix reduction and approximation to principal axes. Psychometrika, 1962, 27, 169-178.

Horst, P. The statewide testing program. Personnel and Guidance Journal, January, 1963.

Horst, P. Residual variance scaling and matrix approximation. Psychological Reports, 1968, 22, 415-430.

Bloxom, B.M. Factorial rotation to simple structure and maximum similarity. Psychometrika, 1968, 33, 237-247.

D. Monographs

Burket, G.R. A study of reduced rank models for multiple prediction. Psychometric Monographs, No. 12, 1964.

Horst, P. The missing data matrix. Journal of Clinical Psychology, Monograph Supplement No. 26, July, 1968.

Horst, P. Configural analysis and pattern recognition. Journal of Clinical Psychology, Monograph Supplement, October, 1968.

E. Chapters in Books

Horst, P. The logic of personnel selection and classification. In R.M. Gagné, et al., Psychological Principles in System Development. New York: Holt, Rinehart and Winston, 1962, pp. 231-271.

Horst, P. Multivariate models for evaluating change. In C.W. Harris, et al., Problems in Measuring Change. Madison, Wisconsin: University of Wisconsin Press, 1963, pp. 104-121.

Horst, P. Matrix factoring and test theory. In N. Frederiksen and H. Gulliksen (Eds.), Contributions to Mathematical Psychology. New York: Holt, Rinehart, and Winston, 1964, pp. 129-140.

Horst, P. An overview of the essentials of multivariate analysis methods. In R.B. Cattell, et al., Handbook of Multivariate Experimental Psychology. Chicago: Rand McNally, 1966, pp. 129-152.

F. Books

Horst, P. Matrix Algebra for Social Scientists. New York: Holt, Rinehart and Winston, 1963.

Horst, P. Factor Analysis of Data Matrices. New York: Holt, Rinehart and Winston, 1965.

Horst, P. Psychological Measurement and Prediction. Belmont, California: Wadsworth Publishing Co., 1966.

Horst, P. Personality: Measurement of Dimensions. San Francisco: Jossey-Bass, 1968.

The final scientific report on Nonr-477(08) Project NR 151-143 consists of titles of publications, theses, and technical reports supported in whole or in part by this contract.

A. Master's and Ph.D. Theses

Meredith, W.M. Cumulative calculation of regression constants. M.S. Thesis. June, 1956.

Clemans, W.V. An analytical and empirical examination of some properties of ipsative measures. Ph.D. Thesis. October, 1956.

Alf, E.F. Configural scoring and prediction. Ph.D. Thesis. November, 1956.

French, G.M. College students' concept of effective teaching determined by an analysis of teacher ratings. Ph.D. Thesis. February, 1957.

Maier, G.E. The contribution of interest test scores to differential academic prediction. Ed.D. Thesis. August, 1957.

Mills, D.F. An iterative selection of variables for predicting certain criteria of academic success at the University of Washington. Ph.D. Thesis. August, 1957.

Dear, R.E. Methods of estimation for Thurstone's absolute scaling model. Ph.D. Thesis. November, 1957.

Lunneborg, C.E. The selection of predictors for some evaluations of faculty performance. M.S. Thesis. December, 1957.

Wright, C.E. Relations between normative and ipsative measures of personality. Ph.D. Thesis. April, 1958.

Meredith, W.M. The estimation of criterion parameters from a biased sample. Ph.D. Thesis. April, 1958.

Hilmer, M.L. Social desirability in a two-choice personality scale. M.S. Thesis. June, 1958.

Johnson, R.M. Re-analysis of Mosier's factor analysis of neurotic items. M.S. Thesis. June, 1958.

Karr, C. A comparison of EPPS scores obtained from the standard forced-choice procedure and a rating-scale procedure. Ph.D. Thesis. October, 1958.

Hodgson, T.F. The general and primary factors in student evaluation of teaching ability. Ph.D. Thesis, October, 1958.

Langen, T.D.F. Differential prediction of naval science and aptitude grades at the University of Washington from batteries of fourteen and of three variables. M.Ed. Thesis. October, 1958.

Gocka, E.F. A comparison of some analytic methods of rotation in factor analysis. Ph.D. Thesis. February, 1959.

Mees, H.L. Preliminary steps in the construction of factor scales for the MMPI. Ph.D. Thesis. July, 1959.

Hebenstreit, W.J. The prediction of college success from biographical data and self-ratings. M.S. Thesis. July, 1959.

Johnson, R.M. Differential prediction with incomplete criterion data. Ph.D. Thesis. August, 1959.

Lunneborg, C.E., Jr. Dimensional analysis, latent structure, and the problem of patterns. Ph.D. Thesis. September, 1959.

Campbell, M.M. The primary dimensions of item ratings on scales designed to measure 24 of Murray's manifest needs. Ph.D. Thesis. December, 1959.

Burket, G.R. A mathematical control for social desirability response set. December, 1959.

Burk, H.W. The effect of limiting the number of iterations on a principal axes factor analysis solution. M.S. Thesis. February, 1960.

Talbott, R.D. The multiple predictive efficiency of ipsative and normative personality measures. M.S. Thesis. February, 1960.

Hillmer, Max. L., Jr. Comparability of factor structure of personality items under varied instructions. Ph.D. Thesis. May, 1960.

Shanker, Prem. The contribution of EPPS scores to differential and multiple absolute academic prediction. Ph.D. Thesis. April, 1961.

Taylor, B. H. Groups of homogeneous criterion variables in multivariate prediction. Ph.D. Thesis. January, 1962.

B. Technical Reports

MacEwan, Charlotte. Augmenting a differential prediction battery: arbitrary pre-selection procedure versus arbitrary post-selection procedure. May, 1956.

Dear, R. A comparison of Thurstone's method of absolute scaling with several other methods of estimating intelligence parameters.

Horst, P. Optimal estimates of multiple criteria with restrictions on the covariance matrix of estimated criteria. March, 1957.

Horst, P. & Charlotte MacEwan. Predictor elimination techniques for determining multiple prediction batteries. September, 1957.

Horst, P. How much information on test results should be given to students: views of a research psychologist. September, 1958.

Horst, P. Multiple regression analysis in differential classification and prediction. March, 1959.

Horst, P. Differential prediction of academic success. May, 1959.

Horst, P. Relationship between pre-admission variables and success in college. June, 1959.

Horst, P. Relations among m sets of variables. December, 1959.

Horst, P. Essential characteristics and special cases of multivariate analysis designs. December, 1960.

Horst, P., A. Dvorak, & C. Wright. Computer application to psychological problems. December, 1960.

Horst, P. Computations involving inverses. February, 1961.

Horst, P. Generalized canonical correlations and their applications to experimental data. February, 1961.

Horst, P. The logic of personnel selection and classification. March, 1961.

Horst, P. The statewide testing program. June, 1961.

MacEwan, Charlotte. Methods of approach at the Univ. of Wash. to the problem of analytic rotation to a simple structure matrix. July, 1961.

Horst, P. Matrix reductions and approximations to principal axes. July, 1961.

Horst, P. Matrix algebra for social scientists, I, II, III, IV. Sept., 1961.

C. Published Articles

Horst, P. Pattern analysis and configural scoring. J. clin. Psychol., Vol. X, No. 1, January, 1954.

Horst P. The maximum expected correlation between two multiple-choice tests. Psychometrika, Vol. 19, No. 4, December, 1954.

Horst, P. A technique for the development of a differential prediction battery. Psychol. Monogr., Vol, 68, No. 9, (380) 1954.

Horst, P. The estimation of immediate retest reliability. Educ. & Psychol. Measmt., Vol. 14, No. 4, Winter, 1954.

Horst, P. A technique for the development of a multiple absolute prediction battery, Psychol. Monogr., Vol 69, No. 5, (390) 1955.

Horst, P. Multiple classification by the method of least squares. J. clin. Psychol., Vol. XII, No. 1, January, 1956.

Horst, P. The prediction of academic success in college. College of Educ. Record., Vol. 22, No. 3, March, 1956.

Horst, P. Optimal test length for maximum differential prediction. Psychometrika, Vol. 21, No. 1, March, 1956.

Horst, P. (with Schaie) The multiple group method of factor analysis and rotation to a simple structure hypothesis. J. Experimental Educ., Vol. 24, March, 1956.

Horst, P. Simplified computations for the multiple group method of factor analysis. Educ, & Psychol. Measmt., Vol. 16, No. 1, Spring, 1956.

Horst, P. (with MacEwan) Optimal test length for maximum absolute prediction. Psychometrika, Vol. 21, No. 2, June, 1956.

Horst, P. A simple method for rotating a centroid factor matrix to a simple structure hypothesis. J. Experimental Educ., Vol 24, No. 4, June, 1956.

Horst, P. The differential prediction of success in various college course areas. College and Univ., July, 1956.

Horst, P. Least square multiple classification for unequal subgroups. J. clin. Psychol., Vol. XII, No. 4, October, 1956.

Horst, P. Educational and vocational counseling from the actuarial point of view. Pers. & Guidance J., November, 1956.

Horst, P. The uniqueness of configural test item scores. J. clin. Psychol., Vol. 8, No. 2, April, 1957.

Horst, P. (with Strother & Schaie) The relationship between advanced age and mental abilities. J. Abn. & Clinical Psychol., Vol 55, No. 2, September, 1957.

Horst, P. Differential prediction in college admissions. College Board Review, No. 33, Fall, 1957.

Horst, P. (with MacEwan) Optimal test length for multiple prediction: the general case. Psychometrika, Vol. 22, No. 4, December, 1957

Horst, P. (with C. Wright) The comparative reliability of two techniques of Personality appraisal. J. clin. Psychol., Vol. 15, No. 4, October, 1959.

Horst, P. How much information on test results should be given to students: views of a research psychologist. J. couns. Psychol., Vol. 6, No. 3, Fall, 1959.

Horst, P. Mathematics on psychological research. Psychol. Reports, No. 6 February, 1960.

Horst, P. Optimal estimates of multiple criteria with restrictions on the covariance matrix of estimated criteria. Psychol. Reports, Monog. Suppl. 6-V6, June, 1960.

Horst, P. (with MacEwan) Prediction elimination techniques for determining multiple prediction batteries. Psychol. Reports, Monog. Suppl. 1-V7, August, 1960.

Horst, P. Generalized canonical correlations and their applications to experimental data. J. clin. Psychol , Monog. Suppl. No. 14, October, 1961.

Horst, P. Relations among m sets of variables. Psychometrika, Vol. 26, No. 2, June, 1961.

Horst, P. (with Dvorak & Wright) Computer application to psychological problems. Educ. & Psychol. Measmt., Vol. 21, No. 3., Autumn, 1961.